Morris Arboretum Bulletin

November, 1942

Volume 4. Number 3

Fig. 9. Snow Azalea
Rhododendron mucronatum Don.

Published by
The ASSOCIATES of
THE MORRIS ARBORETUM

THE MORRIS ARBORETUM OF THE UNIVERSITY OF PENNSYLVANIA

MAINTAINED BY

THE MORRIS FOUNDATION

The Morris Arboretum Bulletin is published quarterly at 111 East Chestnut St., Lancaster, Pa., by the Associates of the Morris Arboretum, Chestnut Hill, Philadelphia, Pa. Entered as second-class matter August 29, 1942 at the post office at Lancaster, Pa., under the Act of August 24, 1912. Annual subscription $1.00. Single copies 30 cents. Free to Associates of the Arboretum.

THE ASSOCIATES OF THE MORRIS ARBORETUM

The ASSOCIATES, through whose interest and generosity this *Bulletin* and certain other undertakings of the Arboretum are made possible, is an informal group of individuals interested in encouraging and furthering the educational and research endeavors of the Morris Arboretum. Further information concerning this organization will be sent on request.

THE SNOW AZALEA

A recent and prized addition to the collections of the Morris Arboretum is a magnificent specimen of the Snow Azalea, *Rhododendron mucronatum,* presented jointly by Mrs. Theodore R. Keyes and Mrs. Janet R. Nevitt in memory of their parents, Mr. and Mrs. Joseph T. Ross of Germantown, Pa. Illustrated in its new surroundings on page 21, this beautifully developed plant measures 17 feet in diameter and almost seven feet in height at an age of between 45 and 50 years, and is probably one of the finest specimens of its kind in the country.

In 1921 E. H. Wilson referred to the largest of his acquaintance as growing at Winterthur, Delaware, on the estate of Mr. Henry DuPont—a plant measuring 12 feet 2 inches in diameter and 6 feet 9 inches in height. If still larger ones exist we do not happen to have heard of them.

Rhododendron mucronatum needs little introduction to those who garden from Philadelphia or Long Island southwards. It is the fine large flowered, pure white Azalea which has often been referred to in nurseries as *Azalea indica alba.* It is reasonably hardy in this region though requires protection farther north.

The Snow Azalea has long been a favorite in the gardens of the wealthy in many parts of China although it appears to have been introduced to the western world from Japan where it is known as Shiro-yodogawa or "White Yodogawa". The first note of its existence in this country dates from 1838, when it is recorded to have been growing in Watertown, Massachusetts.

The parentage of this white form of obvious garden origin long remained a mystery. Nowadays, however, Wilson's opinion is generally held that *R. mucronatum* is a garden variety of *R. mucronatum* var. *ripense,* a rose flowered species found wild along the river banks of southern Japan. The apparent name inversion of species and variety is a result of the fact that discovery of the wild prototype occurred after the naming of its white variety.

A similar situation obtains with the magenta Yodogawa Azalea, of which the double flowered garden form is *R. yedoense,* while the single flowered parent species, of later discovery, becomes the apparent "variety", *R. yedoense* var. *poukhanense*—a state of affairs which is readily understandable to the botanist though often distinctly confusing to the layman.

H. T. S.

WINTER PROTECTION OF EVERGREENS

HENRY T. SKINNER

The best days of fall are past. Frosts are in the air. It is time that every gardener should think about finishing up the year's work and putting his plants to bed for the winter. A little time spent now in preparation for cold weather may save many regrets, plant replacements or visits to the plant doctor during next spring and summer. This is particularly true if garden effects rely chiefly upon the use of ornamental evergreens—either conifers such as pines, yews or cedars or the broad leaved types like the boxwoods or rhododendrons.

Not all evergreens will need protection over winter. Hardy, established plants will usually be quite all right without. It is the ones of more tender constitution, plants newly set or those in particularly exposed locations which will need attention most.

Winter injury is a rather peculiar phenomenon. It is apt to strike at a time when we least suspect that there is danger and then not be apparent in its effects until many weeks or sometimes months later. In looking over our evergreens this summer there were doubtless some of us who observed an occasional dead branch in the top of our Irish Yew or in the side of our favorite rhododendron. There were occasional dead branches this year, though very few compared with 1941. 1943 is as yet a question mark. Dying of tips or branches is not always due to winter injury but the latter is the commonest cause. Had the branches been watched earlier it would have been seen that the first sign of trouble in spring is a browning of the leaf tips. This browning is apt to spread and follow downwards until ultimately, in late summer, it may perhaps involve a large part of the tree or bush.

Injury may be often localized to a single side or part of a tree. The southern side or the side most exposed to drying winds may present a scorched appearance from April onwards. But there may also be other effects. The killing of flower buds is one. This is often a serious matter with the evergreen rhododendrons. The plant itself may appear to have wintered well and not until June when the customary flower display fails to materialize do we realize that all was not well during those cold bright days of winter.

What is the cause of these various types of injury? From the horticultural standpoint the explanation is fairly simple. We know that all plants evaporate moisture from their leaves. With deciduous plants this moisture loss is reduced to a minimum during winter when the leaves have fallen; but with evergreens water loss continues throughout the year. It may proceed at a slower rate in winter but it continues just the same. Now all water lost from the leaves must be made up for by the absorption of an equal supply by the roots if the plant is to remain in a healthy condition. If for any reason more water is lost from the leaves than is taken in by the roots certain plant tissues must suffer; the leaf cells will be dried out and they will die. This is exactly what happens in the commonest form of winter injury.

During winter, tree roots are partially dormant. The ground surrounding them may be frozen so that water becomes unavailable. If at this time the plant is exposed to drying winds, bright sunlight, low humidities, or a combination of these various conditions which encourage a rapid loss of water by the leaves, it is clear that this water cannot be immediately replaced by the roots. Winter injury will result. The part of winter when the ground is frozen hardest, when winds are dry and suns are bright falls in the month of March. This is the month when protection is most sorely needed by plants.

Newly transplanted shrubs and especially those moved late in the fall are particularly susceptible to injury because their root systems are not yet functioning properly. The danger of excessive water loss is doubly acute.

It will be seen that winter injury may not be due so much to excessive cold, as is often thought, but rather to conditions of fluctuating temperature. Extreme temperature variations and bright sunny days following cold nights are very likely to result in injury, especially, as has been said, if these bright days are accompanied by low humidities and drying winds.

This is undoubtedly the type of injury which was most prevalent during the winter of 1940-41, but, while it is probably the commonest and, when it strikes, the most severe, other forms of injury

certainly do occur, of which direct freezing is one. Unfortunately, the underlying cause of winter hardiness or its converse, frost susceptibility, are even now but little understood. The ability of plants to satisfactorily withstand more or less severe freezing is an inherited factor in that it varies with species and varieties but it is also a conditioned factor in that a given species may show different degrees of frost tolerance from year to year. In general, this second variation seems to be rather intimately related to the condition of shoots and tissues on the approach of winter. A sunny growing season with moderate rain is likely to produce well ripened shoots amply stocked with food reserves which tend to be " hardy " regardless of sudden or extreme drops in temperature. A wet, cloudy season, on the other hand, an excess of fertilizers or too late pruning may result in soft, watery and poorly ripened tissues which grow late and suffer in consequence when the first severe freezes occur. Injury to flower buds may be fundamentally attributable to " drying " as already described, but it may also merely be a matter of an abnormally late cold spell which catches them after spring development has commenced. Causes and effects are varied, and though apparently simple at first glance, in a second analysis the furnishing of explanations becomes increasingly complicated.

What are the remedies for winter injury? After it has occurred it is unfortunate that little can be done. Damaged branches should be cut back to healthy tissue as soon as possible. New branches will probably fill in again but they will take time to develop. This is an outstanding instance where an ounce of prevention is worth far more than a pound of cure. Prevention through protection is the only real solution. Before discussing protection, however, it may be well to review a few general points in the handling of evergreens which have a rather direct bearing upon the subject.

In the first place, freezing damage is most likely to occur to species freshly moved in late fall. Fall transplanting is always somewhat risky. Spring is the safer season for planting. In a normal winter, evergreens will come through satisfactorily if set before the end of October, but later moving is generally inadvisable. Evergreens should never be permitted to enter winter with their roots in a dry condition. If a period of dry weather precedes the time when the ground may be expected to freeze up, all plants should be given a thorough watering. Losses may be very serious to fall transplanted evergreens not watered in at planting time. All such plants, immediately after they are placed, should have a ridge of soil drawn up around their bases. The center hollow should be filled with water once a week until winter sets in or until soaking rains render continuation unnecessary. When transplanted, the tree should be set firmly in place so that the roots will not move and may take hold quickly. Tall specimens such as cedars or pines should certainly be braced with guy wires or ropes to keep them rigid and upright in the face of strong March winds.

It is assumed of course, in planting, that due consideration will have been given to matters of soil exposure. Bad drainage or poor soil aeration may often contribute to unsatisfactory growth and a predisposition to injury, as also will the planting of tender species in " frost pockets " or exposures especially subject to strong winds or drying sun.

With plants already established, those further details, already mentioned, should not be overlooked. Pruning and the use of fertilizers are to be watched. Vigorous pruning is objectionable after early July, nitrogenous fertilizers are for use at the *start* of the growing season. Unwisely administered, both may induce late growth subject to killing back. Even late cultivation or late rainfall, following a period when the plant was insufficiently supplied with water, may contribute to this same effect.

These preliminary precautions are important. We turn now to the other form of safeguard—protection. It has been explained that one of the major causes of winter injury is rapid water loss from the leaves occurring at a time when the roots, through being frozen, are unable to make up for this loss. The sole object of protection is to correct this situation either by reducing the rate of evaporation from the leaves or by keeping the roots in a condition in which they may function properly. Several forms of protection may be used to reduce water loss by sheltering the top and leaves of the plant. Pine boughs stuck in the ground around smaller specimens, perhaps held in place by a string encircling the plant, will often be quite adequate in breaking the force of the wind and in providing partial shade from strong sun-light. More complete protection is afforded by a cover of corn stalks, woven reeds or burlap held lightly around the plant. Entire beds of

close growing rhododendrons are often covered completely in by burlaps supported on a wooden frame. Burlaps and cornstalks, however, are not very beautiful. Pine boughs, if they can be obtained, are much more pleasing in appearance. Small plants of boxwood or English lavender can be surrounded by a strip of chicken wire, filled in with dead leaves, or they can be covered with a light shaking of buckwheat straw or saltmarsh hay. Ordinary hay contains too many weed seeds. These forms of protection should be in place by January. They serve their most useful purpose during February and March.

Protection to the roots is afforded by the use of a mulch, a covering of leaves, straw or some light material applied to the ground. A light mulch will be of assistance in decreasing rapid fluctuations in soil temperature, while a mulch of leaves two inches thick may entirely prevent the ground from freezing. More than that, it will maintain a uniform moisture supply for the roots to draw upon. A good mulch should be applied to every evergreen moved in the fall, to every plant that is likely to be susceptible to winter injury, and for the purpose several materials can be used. Leaves and straw have been suggested. Spent tan bark is normally obtainable from the leather mills, though it may be in too great demand at the moment for government camouflage purposes. It is quite acid in reaction and is particularly useful as a mulch for rhododendrons and other acid soil plants. A covering such as this may be left in place all the year through for it will be beneficial in summer as well as winter. Hardwood sawdust has a similar use for acid soil plants. Two other materials have definitely come to the fore for mulching purposes in recent years and should be mentioned even though the first, and certainly the second, may be on " other demand " this season; one is ordinary wood excelsior, the other is fiber glass or glass wool. Both of these may be applied in November, removed again in early spring and can then be stored for use in future seasons. It is likely that they will be as valuable in the case of evergreens as they have already proven in the care of perennials. All mulches should be in place on the soil surrounding the plant by mid November and before the ground has frozen to any great extent.

Another form of winter injury should perhaps be mentioned—snow damage or the direct breakage caused by a heavy wet snowfall. This can never be severe if proper attention is given to shaking the plants off immediately after they become weighted down and before the snow commences to thaw. If attention is not immediate, too frequently a frost will follow and the snow burden, frozen fast, may remain for several days, bending the branches and perhaps effecting a permanent ruination to the appearance of the plant. Snow is apt to be most harmful on slender branched types such as oriental arborvitae or the multi-branched junipers. The danger can, however, be minimized by binding a few strips of burlap or strings around these plants in fall. They will hold the branches together and prevent spreading under the weight of wet snow.

The planting of specimens in groups so that they will help to protect one another or the choosing of sheltered locations are good practices to follow, particularly when growing the more tender specimens. The methods of old man winter are insidious and very persistent. Effort on our part is needed now if *all* our plants are to look their best when spring opens up next year.

AN EXPERIMENT IN GREENHOUSE BENCHES

In the propagating and experimental greenhouse built in 1941 at the Arboretum it was desirable to install wooden benches. For various reasons slate, hollow tile, concrete, etc., types were less well adapted. But wooden benches as usually built have a distressingly short life. The conditions of moisture and warmth obtaining in greenhouses are so favorable to the growth and activity of wood-rotting fungi (to which almost all wood decay is due) that ordinary wood benches last but comparatively few years.

But there are at least a few kinds of wood available which are extraordinarily resistant to decay. Following the Arboretum policy that even ordinary utilities be made to yield, where possible, some by-product of educational or experimental interest, it was decided to build the

benches out of one of these woods, namely, that of Black Locust (*Robinia Pseudoacacia*).

This native of the eastern United States is one of the most familiar trees about homesteads, and has become widely naturalized east of the Rockies. Besides its merit as a flowering shade and ornamental tree, it has long been valued for its decay-resistant wood, a quality well known to the Indians. For several centuries it has been sought after for fence posts, sills, and other uses where durability in contact with the soil is important. Of peculiar interest is the prominence it attained in furnishing " treenails " or " trunnels " for constructing wooden ships.

These treenails (the thick long wooden pins holding together timbers, beams, knees, etc.) were subject to great stresses; and with the onset of decay, even slight, these strategic elements commonly sheared off, with obvious serious consequences. Black locust treenails used in the Colonies largely overcame this difficulty owing to their great strength combined with amazing decay resistance. Indeed, a member of Parliament rose to point out that unless the British Navy adopted black locust treenails it could not hope to equal the American ships. By about 1820, Philadelphia alone exported between 50,000 and 100,000 locust treenails to England annually.

Increasingly it has been recognized that there are varieties, races, or clones of black locust differing in decay resistance. Of these the best known is the so-called Shipmast Locust, *Robinia Pseudoacacia* var. *rectissima*, described from Long Island, New York, as a separate botanical variety by Raber in 1936. The name " shipmast " refers to the straight erect trunk in contrast to the more spreading habit of the so-called " common " locust. Introduced into Long Island apparently over two centuries ago from an uncertain source (possibly tidewater Virginia), the lasting qualities of its wood long ago became well known to Long Islanders. Fence posts still sound after one hundred years or more in the ground appears to be a well authenticated fact. Indeed, on occasion posts pass not unlike currency—resold after long service to be again set as posts.

FIG. 10. Two partially constructed benches. The side boards are in place but only one bottom board at each edge, leaving the supporting cross pieces largely visible. The third bench also constructed of shipmast locust is barely visible on the left beyond the partition.

Out of the wood of this extraordinary tree the greenhouse benches were built. The 2" by 4" supporting cross pieces were secured from the sawmill operated by Harned Brothers near Commack, Long Island, from boards which had been air-seasoned for several years. Since the boards from which the pieces were sawn had the very characteristic bark of Shipmast Locust adhering on one or both edges, definite identification was possible. The bottom and side boards, averaging 1¾" in thickness and sawn by the Watson Lumber Service Co. mill at Jericho, Long Island, from freshly felled trees, were air-seasoned for nine months before installation. The trees were inspected by us before felling and identified as the genuine shipmast variety. No preservative was applied to any of the lumber used.

Shipmast Locust has probably rarely been used for greenhouse benches, and never, so far as known, with definite records. Therefore an account is here published of the source, botanical identity, etc., of the wood out of which in the summer of 1941 the benches were constructed through the admirable craftsmanship of Mr. Thomas J. Carney.

The absence at present of data on the lasting qualities of shipmast locust wood under greenhouse conditions precludes a reliable estimate of the probable life of the benches. But from what is known of the performance of the wood under other conditions likewise favoring decay, long life is confidently expected. Perhaps the report chronicling the conclusion of the experiment will be written and read only by our descendants.

J. R. SCHRAMM

NOTES FROM THE LABORATORY

Root Distribution Studies

During the last few years, more and more attention has been paid to the lateral distribution of the roots of trees in answer to the questions concerning the most beneficial areas in which to do fertilizing. According to the older literature, the mycorrhizal or feeding roots of trees were to be found localized in an area which in general was covered by the " drip " from the outer edges of the crown spread. More recent work has shown that, while differing greatly among the species, the area in which the mycorrhizal roots are abundant may be anywhere from the root crown out to a considerable distance beyond the ends of the crown spread. In fact, Gourley and Bechenbaugh (1932) found in their studies of roots of Apple trees that there were fewer feeding roots directly under the drip than within or without this area. Studies at the Arboretum in the past few years have been directed along the lines of determining the lateral root distribution of some of the ornamental conifers. Some of these results have already been published.*

This past summer another system was laid bare and is here noted. An Austrian Pine (*P. nigra austriaca*) having a d. b. h. of 21 inches, crown spread of 26 feet and height of a little over 50 feet was studied. Its case-history included a fertilizing, two years prior to this, at which time Michigan peat, ground limestone and bonemeal were applied in a very shallow trench in a 4-foot band with its inner circumference 13 feet from the trunk (about at the edge of the crown spread). The studies were made by soaking the ground thoroughly for several days prior to excavation. In the actual uncovering work, water was first used to gently wash out the soil for examination of mycorrhizae in situ. This was followed by washing with a fast stream of water from a hose. The latter laid bare all roots of the major part of

FIG. 11. Root system of *Pinus nigra austriaca*

FIG. 12. Root system of *Cedrus atlantica*

* " Fertilizing Precautions to Tree Men," *Arborist's News*, Vol. 6, No. 6, pp. 41-43, June, 1941.

the system in a trench 3 feet wide, over 21 feet from the trunk outward and about 1 foot deep. The accompanying plate (fig. 11) shows the results, each white marker designating 1 foot and the white band showing the area of the circumferential fertilizing. The greatest massing of mycorrhizal roots was in the area from 3 to 8 feet from the root crown—which had been overlain with a thick layer of humus from the normal fall of pine needles. Good mycorrhizal roots were found on all parts of the system out to the end of the trench—21 feet.

Figure 12 shows the root system of an Atlas Cedar (*Cedrus atlantica*). This tree had a d. b. h. of 12 inches, crown spread of 22 feet and height of about 37 feet. Previous fertilizing with commercial fertilizer plus Michigan peat and bonemeal had been done by the shallow-trench method in a band 4 feet wide, its inner limit being 8 feet from the trunk. In this case, the trench which was washed out for the root study was 3 feet wide, over 15 feet long and 3 feet deep. The rather meager root system is seen to be concentrated very close to the root crown, extending out only a little over 3 feet for the major portion, and the furthest extent of any root being not more than 8 feet.

These are just two more illustrations to add to accumulating results which should generally discourage the continuance of this particular method of fertilizing, i. e., the band method—whether applied by trenching or the punch-bar. The ideal prelude to any tree fertilizing would be a sampling of the area to determine the general lay-out of the major part of the root system. While it is contended that the band method of feeding is useful in attracting the roots outward, it must still be recognized that nutrients—particularly phosphorus, move very slowly through the soil. Thus if the fertilizers are not reasonably close to the roots which they are to "feed", no appreciable good may be derived.

SPENCER H. DAVIS, JR.

Poplar Canker. A Note On the Susceptibility of Various Poplar Species

In a recent survey of poplars growing in the Arboretum nursery, the following nineteen species and varieties, with diameters varying up to seven inches, were noted for their susceptibility or resistance to *Dothiciza* canker. The trees were growing in successive rows, thus having equal opportunity of becoming diseased.

Species and varieties showing no cankering:

Populus alba nivea	*P. Maximowiczii*
P. alba Richardii	*P. tomentosa*
P. brevifolia	*P. trichocarpa*
P. euphratica	*P.* GENEVA
P. generosa	

Those in which cankering was severe or in which the majority were cankered:

P. acuminata	*P. Petrowskyana*
P. berolinensis	*P. Przewalskii*
P. canadensis	*P. Sargentii*
P. nigra betulifolia	*P. Simonii fastigiata*
P. nigra italica	*P. suaveolens*

Poplars as a group are often held in rather low esteem for ornamental plantings. While it is true that unfortunate root habits, brittleness and suckering tendencies make them poor trees for use in the city, much of this distrust almost certainly stems from the readily observable susceptibility of one species—the Lombardy—to Poplar Canker. The above observations lend emphasis to the fact that a number of desirable poplar species are relatively canker resistant.

SPENCER H. DAVIS, JR.